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Newton law in covariant unimodular F(R) gravity

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Abstract

© 2016 World Scientific Publishing Company.We investigate the Newton law in the unimodular F(R) gravity. In the standard F(R) gravity, due to the extra scalar mode, there often appear the large corrections to the Newton law and such models are excluded by the experiments and/or the observations. In the unimodular F(R) gravity, however, the extra scalar mode become not to be dynamical due to the unimodular constraint and there is not any correction to the Newton law. Even in the unimodular Einstein gravity, the Newton law is reproduced but the mechanism is a little bit different from that in the unimodular F(R) gravity. We also investigate the unimodular F(R) gravity in the covariant formulation. In the covariant formulation, we include the three-form field. We show that the three-form field could not have any unwanted property, like ghost nor correction to the Newton law. In the covariant formulation, however, the above extra scalar mode becomes dynamical and could give a correction to the Newton law. We also show that there are no difference in the Friedmann-Robertson-Walker (FRW) dynamics in the non-covariant and covariant formulation.

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Keywords

Newton law, Unimodular gravity